



ATTACHMENT A Remarks

Claims 7-12 are pending in the present application. By this Amendment, Applicants have amended claims 7, 8, 11 and 12. Applicants respectfully submit that the present application is in condition for allowance based on the discussion which follows.

Claims 7-12 were rejected under 35 U.S.C. 103(a) as being unpatentable over JP-60-228570 (hereinafter the JP Patent) in view of Masuda et al. U.S. Patent No. 6,042,798 (hereinafter Masuda) or Logsdon et al. U.S. Patent No. 4,876,402 (hereinafter Logsdon). In the Office Action, it was alleged that the JP Patent discloses a desulfurization process by contacting a raw hydrocarbon feed with a catalyst comprising Cu, Zn, and Ni oxide, in the presence of hydrogen.

In order to more clearly recite Applicants' invention, Applicants have amended claim 7 to now recite that the present method comprises desulfurizing a hydrocarbon raw material comprising methane, ethane, propane and butane. Subject matter basis for the amendment to claim 7 can be found in the Specification as filed on page 23, in Table 1 and therefore the amendment to claim 7 does not constitute new matter.

As currently amended, the present invention is directed to a hydrocarbon desulfurization method wherein a hydrocarbon raw material is desulfurized in the presence of hydrogen using a desulfurizing agent manufactured by a method comprising mixing a mixture containing a copper compound and a zinc compound with an aqueous solution of an alkali substance to prepare a precipitate, calcining the resultant precipitate, forming the calcined precipitate into a shaped form of a copper oxide-zinc oxide mixture, impregnating the shaped form with iron and/or nickel, calcining

the impregnated form to produce a calcined oxide, and reducing the calcined oxide with hydrogen, wherein the desulfurization is performed at a space velocity (GHSV) of 200 to 10,000 h⁻¹, and wherein the hydrocarbon raw material comprises methane, ethane, propane and butane.

One of the features of the present invention is to desulfurize a hydrocarbon raw material comprises methane, ethane, propane and butane (i.e. saturated hydrocarbons) by using the specific desulfurizing agent.

According to the feature, excellent hydrocarbon desulfurization performance can be achieved. This fact is clear from Examples 1-3 of the present Specification. For example, in Example 1, when the sulfur content in the town gas after desulfurization of the hydrocarbon raw material comprising methane, ethane, propane, and butane (see Table 1) was measured continuously, it was found that this content was always 0.1 ppb or less in 8,000 hours of operation.

The Examiner points out in page 3 lines 12-18 of the Office Action that

“The JP Patent does not disclose that the desulfurization step is operated at a space velocity (GHSV) of 200 to 10,000 h⁻¹. However, Masuda discloses a hydrosulfurization process wherein the process is operated at a space velocity (GHSV) of about 1,000 h⁻¹ (See examples). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of the JP Patent by operating the desulfurization step at a space velocity as taught by Masuda because such space velocity is known to be effective in a desulfurization process”.

However, Masuda fails to disclose the desulfurization of a hydrocarbon raw material comprises methane, ethane, propane and butane. Masuda is directed to a method for the desulfurization of a gas comprising unsaturated hydrocarbons such as ethylene or propylene (See claim 1, col. 5, lines 9-20, Examples 1-17 of Masuda). In other words, Masuda aims at desulfurizing a gas comprising unsaturated hydrocarbon, not a gas comprising specific saturated hydrocarbons.

In addition, as shown in Examples of Masuda, the sulfur compound content is at a level under an average of 0.1 ppm throughout the operation for 36 hours. In the present invention, the sulfur content is always 0.1 ppb or less in 8,000 hours of operation (See examples of the present Specification).

Thus, the gas composition and the sulfur content of Masuda are different from those of the present invention.

Furthermore, the JP Patent and Masuda fail to provide any motivation or suggestion to modify the process of the JP Patent by operating the desulfurization step at a space velocity as taught by Masuda which is not suggestive of the gas combination and the sulfur content of the present invention.

Moreover, the JP Patent merely discloses that the sulfur content is 0.1 ppm or less (See paragraphs [0034] and [0050], Table 2).

Finally, one of ordinary skill in the art would not expect the advantages (the sulfur content of 0.1 ppb or less in 8,000 hours of operation) of the present invention even from the JP Patent as well as Masuda or Logsdon.

Based on the foregoing, the present invention as recited in claim 7 is not obvious in view of the aforementioned prior art. Accordingly, Applicants respectfully request that

the rejection to claim 7 and dependent claims 8-12, which depend therefrom, under 35 U.S.C. 103(a) be withdrawn.

Finally, by the Amendment, Applicants have amended claims 8, 11 and 12 to be in a more conventional U.S. claim form, but in no way does the amendments to these claims affect the scope or claim coverage.

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance.

END REMARKS